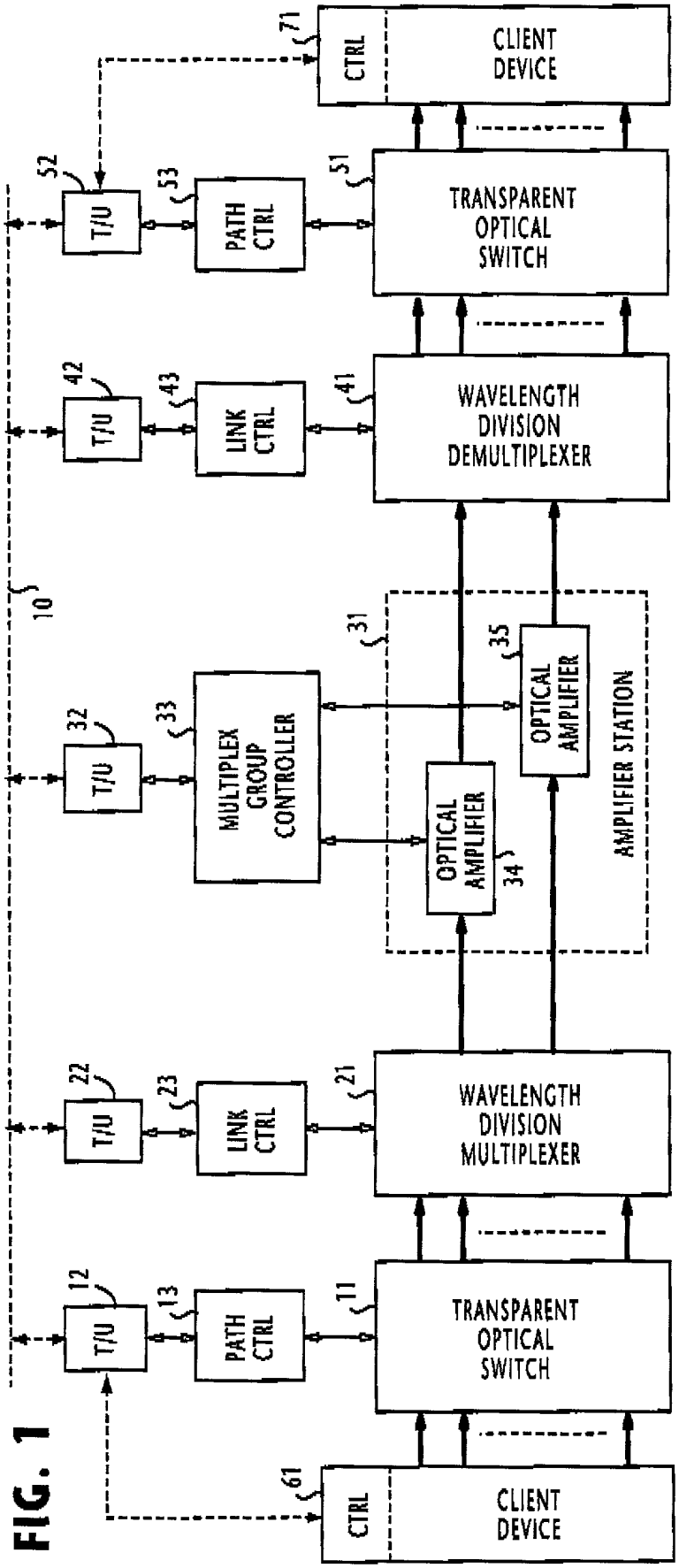


FIG. 1

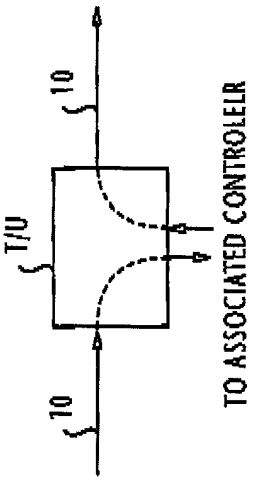


FIG. 1b

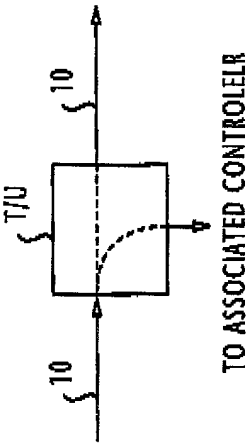


FIG. 1a

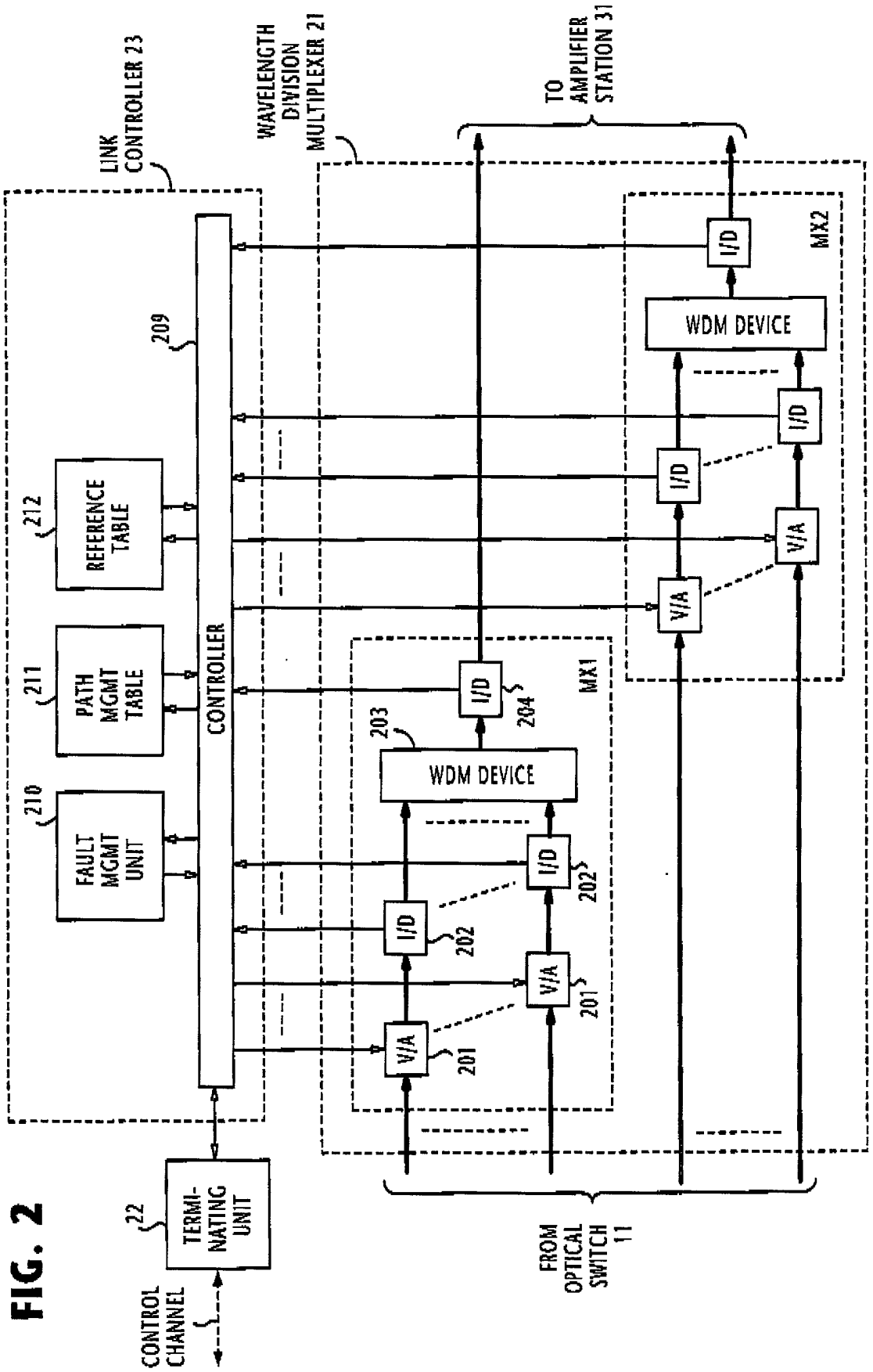

LINK CONTROLLER 23
WAVELENGTH DIVISION MULTIPLEXER 21
TO AMPLIFIER STATION 31
209
212
REFERENCE TABLE
211
PATH MGMT TABLE
210
FAULT MGMT UNIT
CONTROLLER
MX1
MX2
WDM DEVICE
I/D
V/A
203
204
202
201
22
TERMI-NATING UNIT
CONTROL CHANNEL
FROM OPTICAL SWITCH 11

FIG. 2

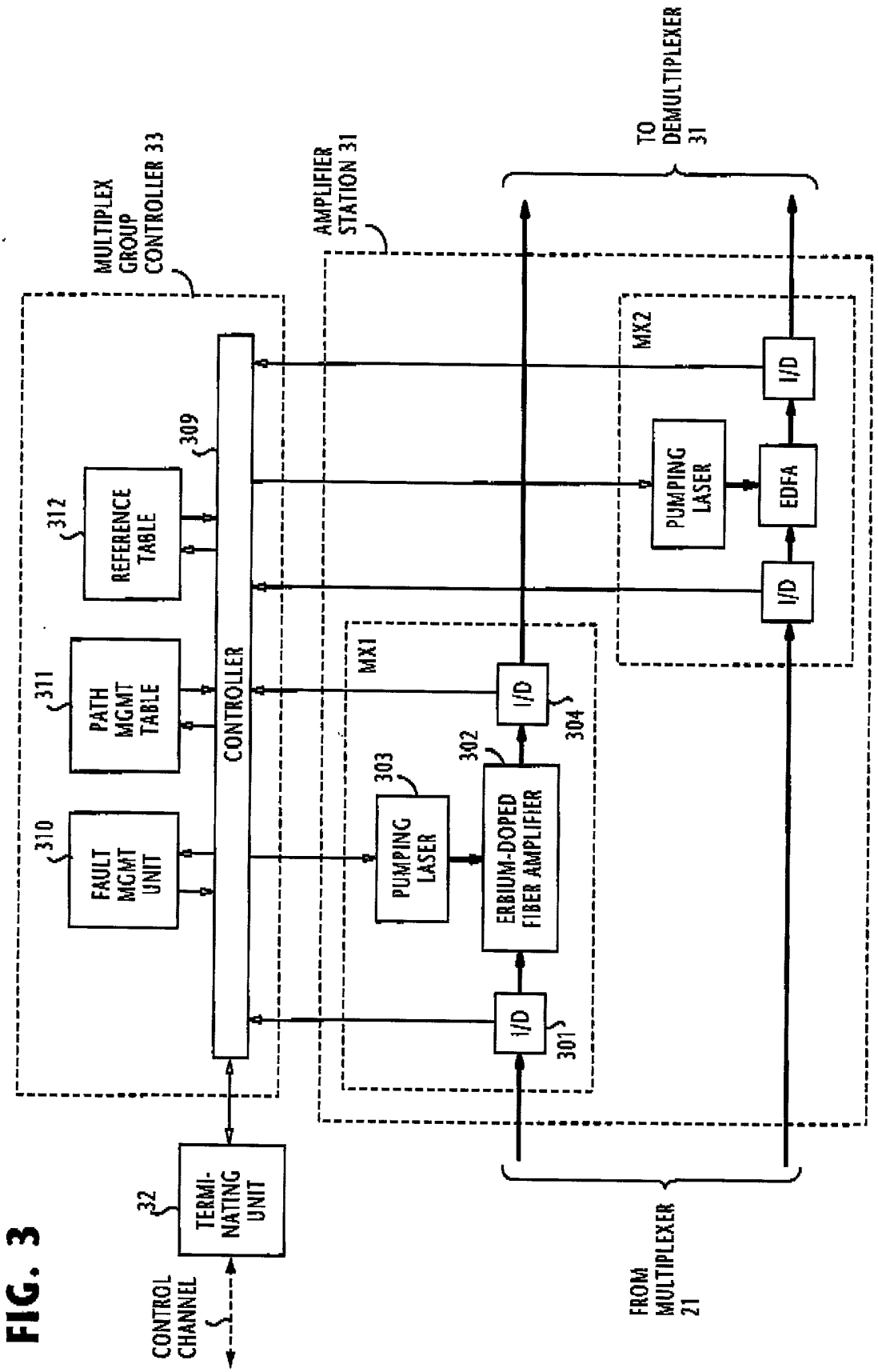

MULTIPLEX GROUP CONTROLLER 33
AMPLIFIER STATION 31
TO DEMULTIPLEXER 31
FROM MULTIPLEXER 21
CONTROL CHANNEL
32
TERMI-NATING UNIT
CONTROLLER
309
312
REFERENCE TABLE
311
PATH MGMT TABLE
310
FAULT MGMT UNIT
MX1
MX2
I/D
301
304
302
ERBIUM-DOPED FIBER AMPLIFIER
303
PUMPING LASER
PUMPING LASER
EDFA
I/D
I/D

FIG. 3

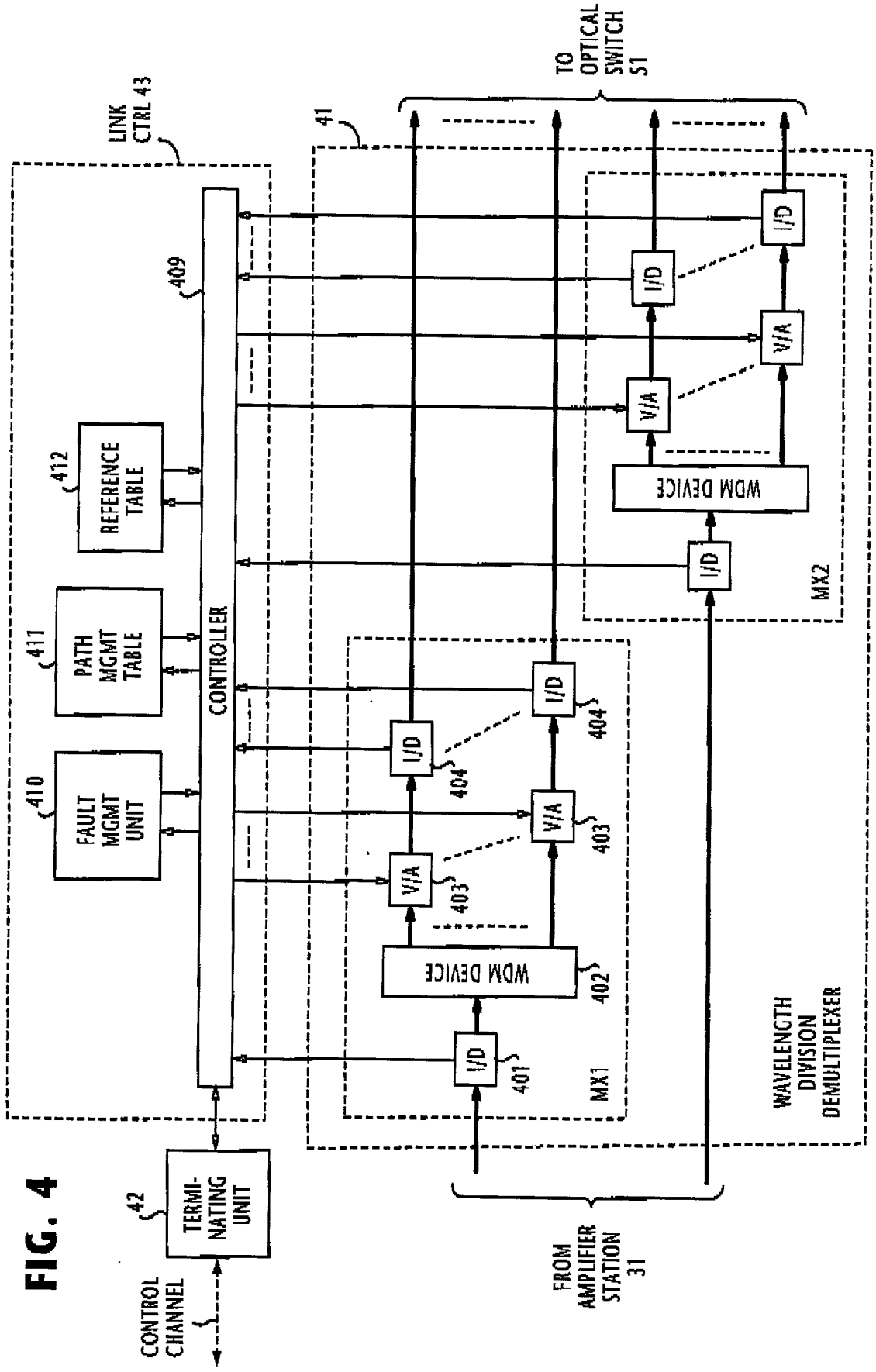

TO OPTICAL SWITCH 51
LINK CTRL 43
41
409
412
REFERENCE TABLE
411
PATH MGMT TABLE
410
FAULT MGMT UNIT
CONTROLLER
I/D
V/A
WDM DEVICE
404
403
402
401
MX1
MX2
WAVELENGTH DIVISION DEMULTIPLEXER
42
TERMI-NATING UNIT
CONTROL CHANNEL
FROM AMPLIFIER STATION 31

FIG. 4

FIG. 5A

PATH MANAGEMENT TABLE (LINK CONTROLLER)

PATH NUMBER	WAVELENGTH NUMBER	LINK NUMBER	TRANSMISSION RATE	DATA FORMAT	MULTIPLEX GROUP NO.	REF. OPTICAL INPUT INTENSITY	REF. OPTICAL OUTPUT INTENSITY
#11	λ1	#1	2.5 Gbps	SONET	#1	-10 dBm	-15 dBm
#12	λ4	#1	2.5 Gbps	SONET	#1	-10 dBm	-15 dBm
#21	λ2	#3	10 Gbps	SONET	#1	-8 dBm	-13 dBm
#22	λ3	#4	10 Gbps	SONET	#1	-8 dBm	-13 dBm
#31	λ1	#6	1 Gbps	GEther	#2	-12 dBm	-17 dBm
#32	λ2	#6	1 Gbps	GEther	#2	-12 dBm	-17 dBm

FIG. 5B

PATH MANAGEMENT TABLE (MULTIPLEX GROUP CONTROLLER)

PATH NUMBER	WAVELENGTH NUMBER	TRANSMISSION RATE	DATA FORMAT	MULTIPLEX GROUP NO.	REF. OPTICAL INPUT INTENSITY	REF. OPTICAL OUTPUT INTENSITY
#11	λ1	2.5 Gbps	SONET	#1	-10 dBm	0 dBm
#12	λ4	2.5 Gbps	SONET	#1	-10 dBm	0 dBm
#21	λ2	10 Gbps	SONET	#1	-8 dBm	2 dBm
#22	λ3	10 Gbps	SONET	#1	-8 dBm	2 dBm
#31	λ1	1 Gbps	GEther	#2	-12 dBm	-2 dBm
#32	λ2	1 Gbps	GEther	#2	-12 dBm	-2 dBm

FIG. 6

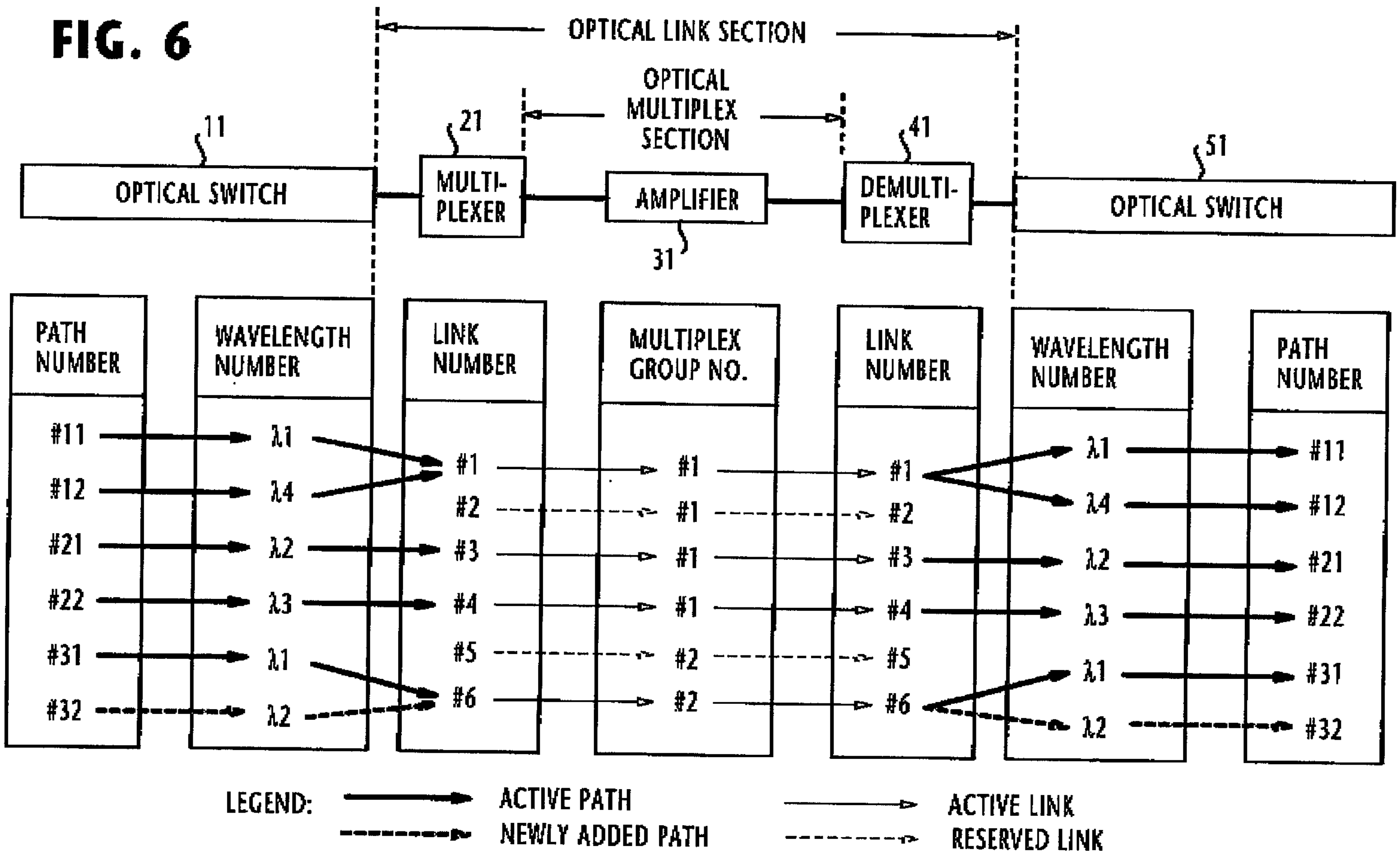


FIG. 7

CONTROL (SETUP) MESSAGE FORMAT

MESSAGE TYPE	PATH NUMBER	WAVELENGTH NUMBER	LINK NUMBER	MULTIPLEX GROUP NO.	TRANSMISSION RATE	DATA FORMAT	DESTINATION SW NUMBER
SETUP	#32	λ2	#6	#2	1 Gbps	GEther	300

FIG. 8A

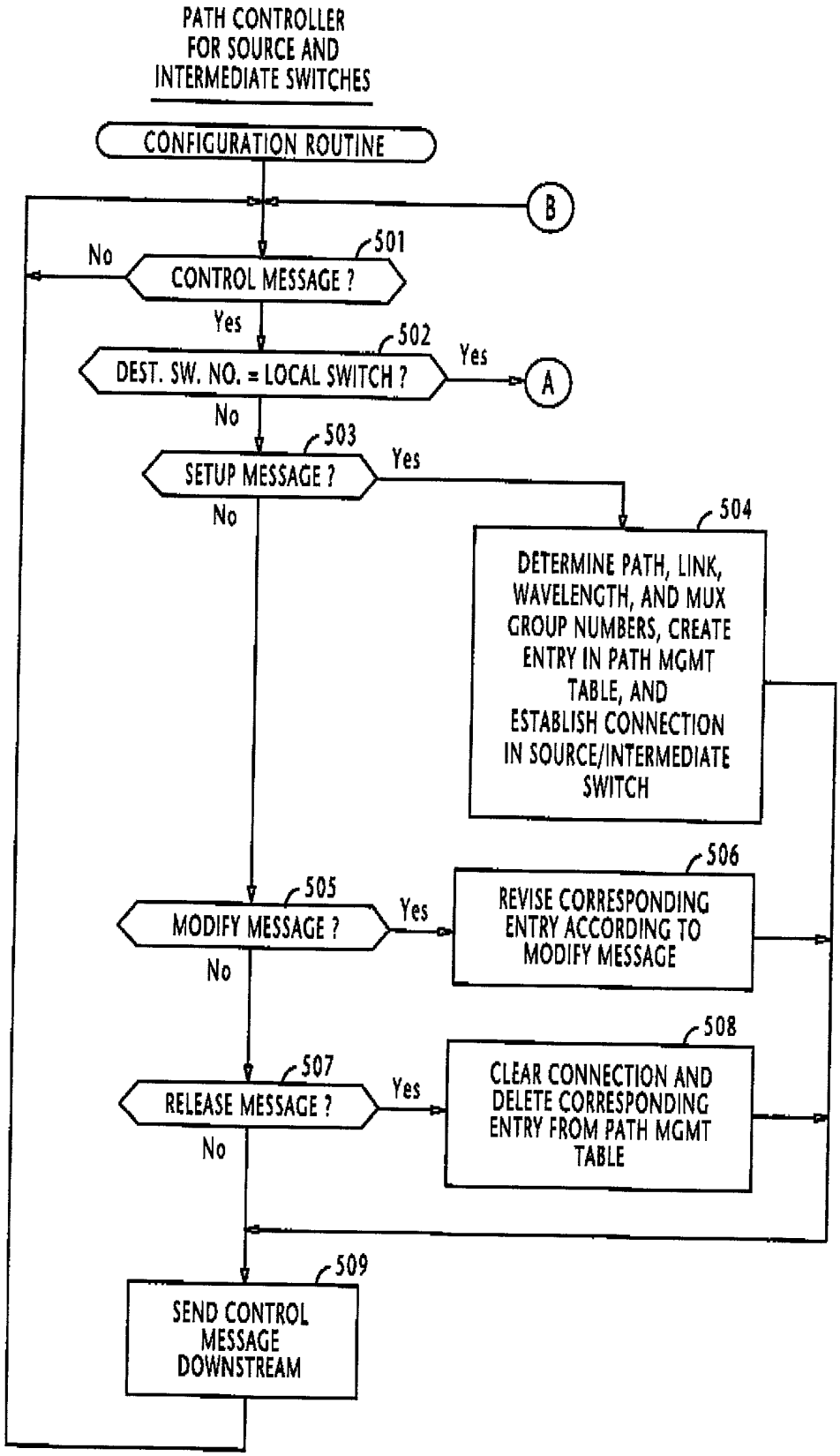

PATH CONTROLLER FOR SOURCE AND INTERMEDIATE SWITCHES
CONFIGURATION ROUTINE
B
501
No
CONTROL MESSAGE ?
Yes
502
DEST. SW. NO. = LOCAL SWITCH ?
Yes
A
No
503
SETUP MESSAGE ?
Yes
No
504
DETERMINE PATH, LINK, WAVELENGTH, AND MUX GROUP NUMBERS, CREATE ENTRY IN PATH MGMT TABLE, AND ESTABLISH CONNECTION IN SOURCE/INTERMEDIATE SWITCH
505
MODIFY MESSAGE ?
Yes
No
506
REVISE CORRESPONDING ENTRY ACCORDING TO MODIFY MESSAGE
507
RELEASE MESSAGE ?
Yes
No
508
CLEAR CONNECTION AND DELETE CORRESPONDING ENTRY FROM PATH MGMT TABLE
509
SEND CONTROL MESSAGE DOWNSTREAM

FIG. 8B

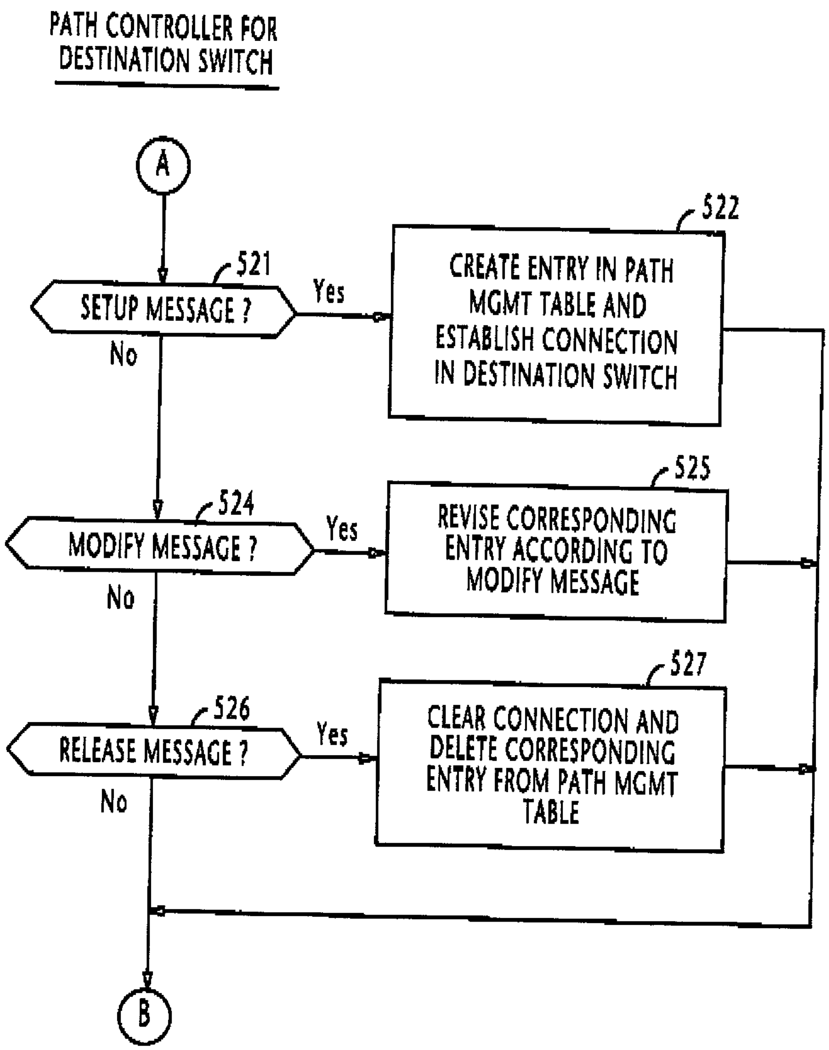
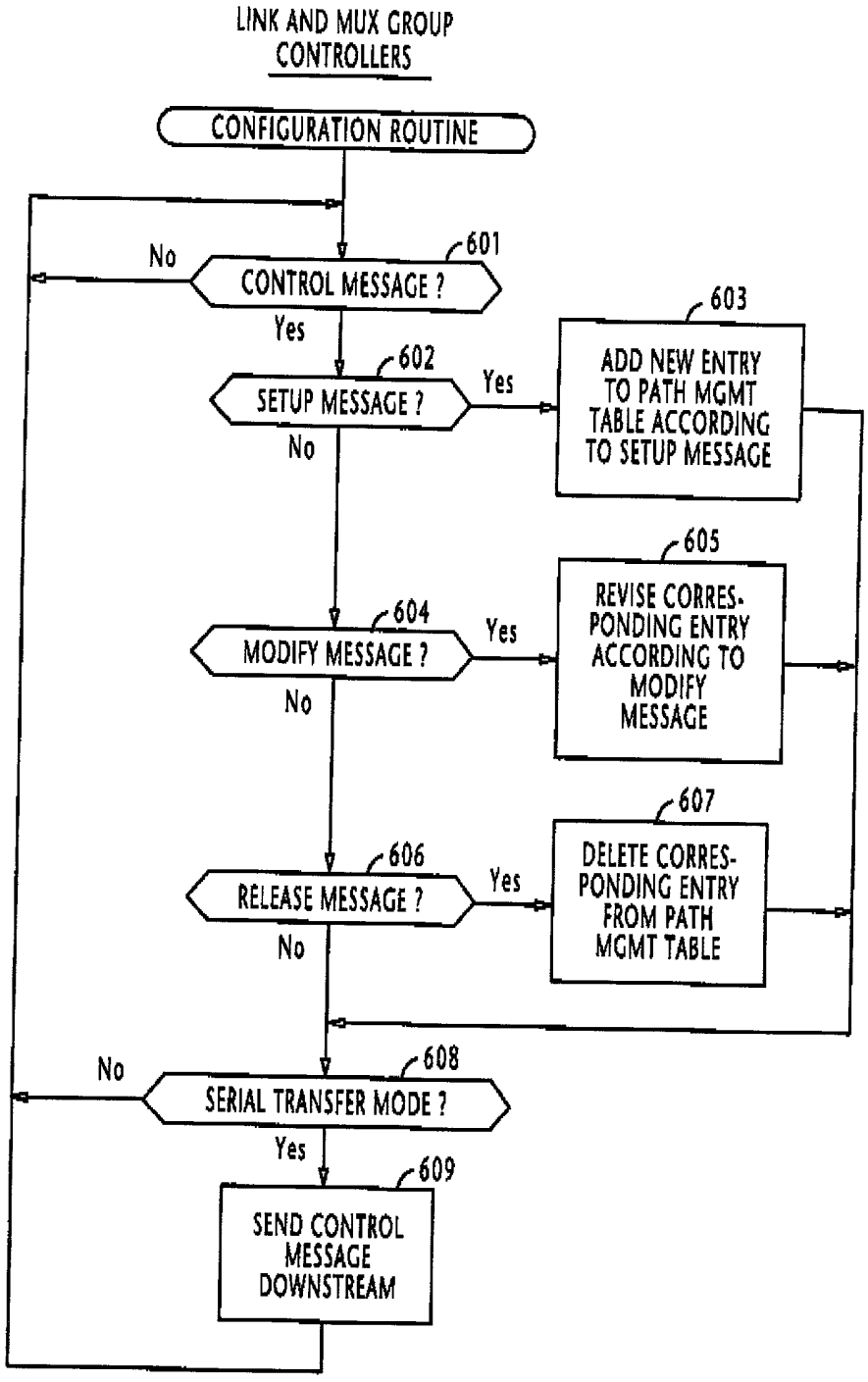


FIG. 9


LINK AND MUX GROUP CONTROLLERS
CONFIGURATION ROUTINE
601
CONTROL MESSAGE ?
No
Yes
602
SETUP MESSAGE ?
Yes
No
603
ADD NEW ENTRY TO PATH MGMT TABLE ACCORDING TO SETUP MESSAGE
604
MODIFY MESSAGE ?
Yes
No
605
REVISE CORRES-PONDING ENTRY ACCORDING TO MODIFY MESSAGE
606
RELEASE MESSAGE ?
Yes
No
607
DELETE CORRES-PONDING ENTRY FROM PATH MGMT TABLE
608
SERIAL TRANSFER MODE ?
No
Yes
609
SEND CONTROL MESSAGE DOWNSTREAM

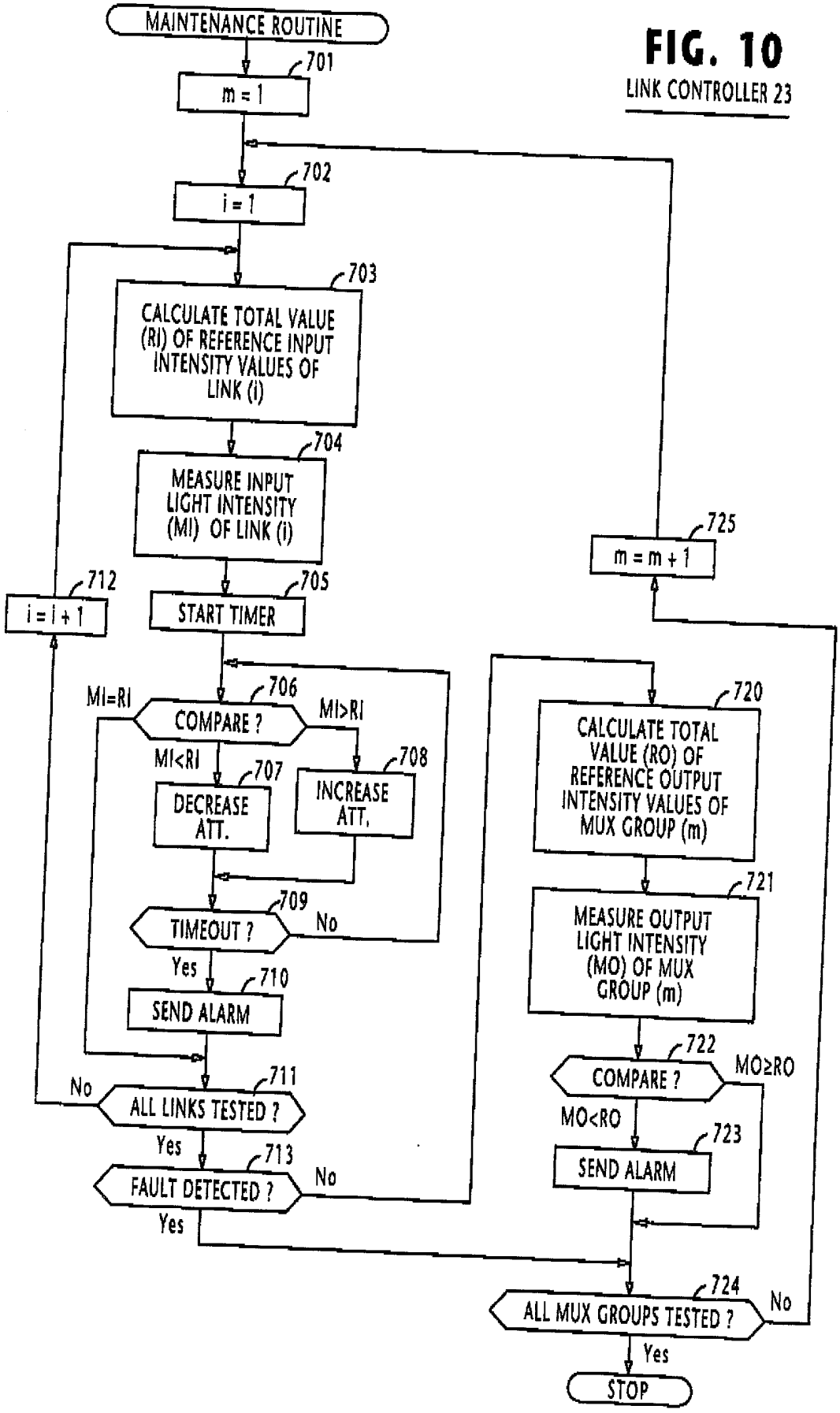


FIG. 10
LINK CONTROLLER 23

FIG. 11

MULTIPLEX GROUP CONTROLLER 33

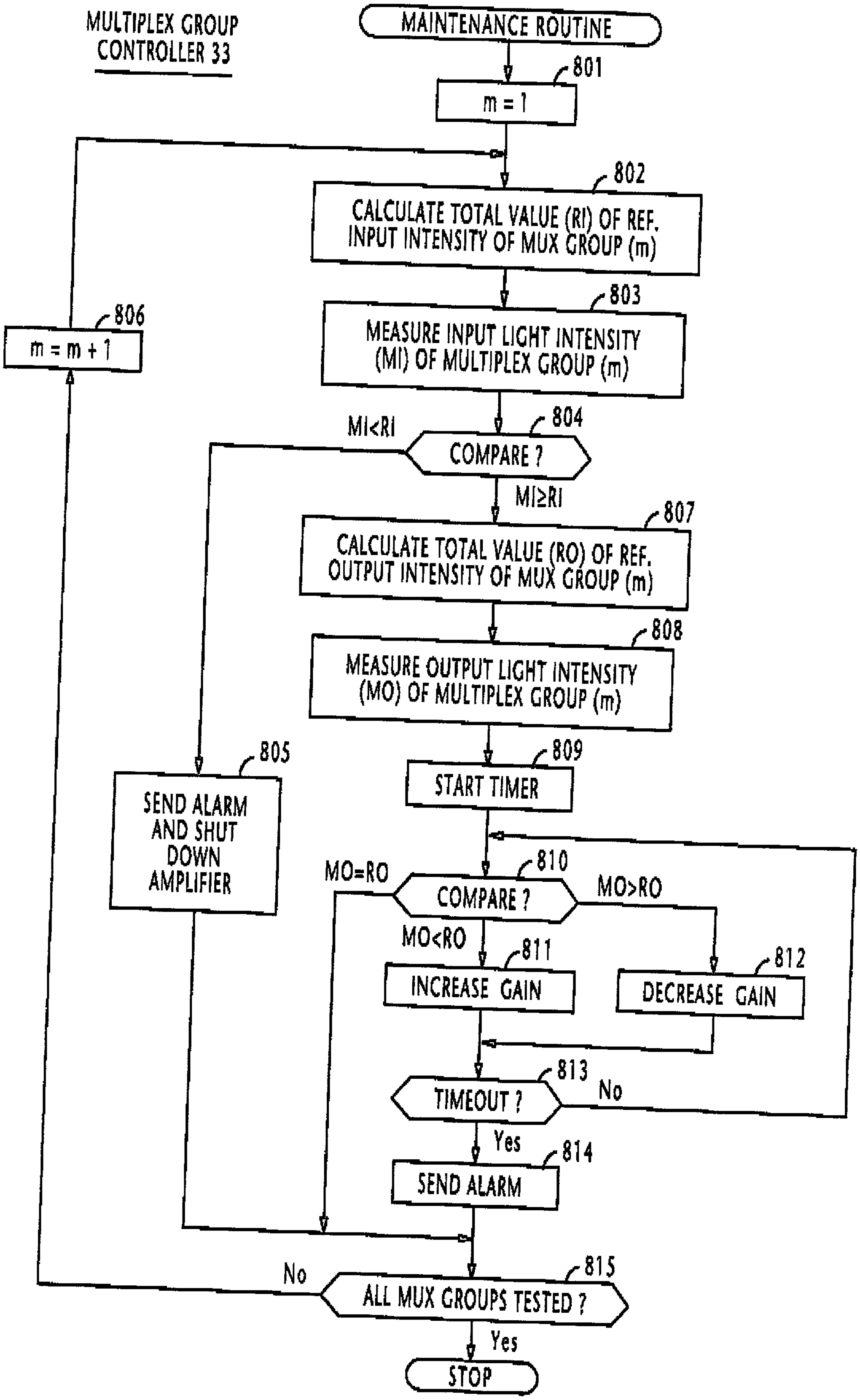

MAINTENANCE ROUTINE
801
m = 1
802
CALCULATE TOTAL VALUE (RI) OF REF. INPUT INTENSITY OF MUX GROUP (m)
803
MEASURE INPUT LIGHT INTENSITY (MI) OF MULTIPLEX GROUP (m)
804
COMPARE ?
MI<RI
MI≥RI
805
SEND ALARM AND SHUT DOWN AMPLIFIER
806
m = m + 1
807
CALCULATE TOTAL VALUE (RO) OF REF. OUTPUT INTENSITY OF MUX GROUP (m)
808
MEASURE OUTPUT LIGHT INTENSITY (MO) OF MULTIPLEX GROUP (m)
809
START TIMER
810
COMPARE ?
MO=RO
MO>RO
MO<RO
811
INCREASE GAIN
812
DECREASE GAIN
813
TIMEOUT ?
No
Yes
814
SEND ALARM
815
ALL MUX GROUPS TESTED ?
No
Yes
STOP

FIG. 12

LINK CONTROLLER 43